

PATENT CLAIMS

1. A machine reaming tool, comprising a shaft (2) and an exchangeable, single-piece interchangeable head (1), characterised in that the interchangeable head (1) in the axial direction and at each location, thus including the means for exchange adaptation, is thinner than a maximal thickness h_{\max} , wherein this maximal thickness h_{\max} in millimetres is computed from a diameter D1 of the interchangeable head in millimetres as $h_{\max} = 6\text{mm} + (1/10) \cdot (D1 - 12\text{mm})$.
2. A machine reaming tool according to claim 1, wherein the interchangeable head (1) in a plane, shaft-side end-face (15) comprises a cutout (50) designed as a connection element, for the centring fastening of the interchangeable head (1) on the shaft (2), and that the shaft (2) on an end-side plane surface (25) comprises a connection lug (21) projecting from this plane surface (25) in the axial direction, said lug corresponding to the cutout (50) of the interchangeable head (1).
3. A machine reaming tool according to claim 2, wherein the interchangeable head (2) at least in places compresses the connection lug (21) of the shaft (2) when pressing the interchangeable head (11) against the shaft (2) in the axial direction.
4. A machine reaming tool according to claim 3, wherein on the interchangeable head (1), the cutout (50) formed as a connection element forms an axially central conical socket (11) for centring the interchangeable head (1) on the shaft (2), and the connection lug is a corresponding conical projection (21) on the shaft (2).
5. A machine reaming tool according to claim 4, wherein on the interchangeable head, the conical socket (11) comprises at least three exposed contact segments (52).
6. A machine reaming tool according to claim 2, wherein the cutout (50) formed as a connection element, in the end-face (15) of the interchangeable head (1), is cylindrical, and that the interchangeable head (1) on assembly on the shaft (2), may be brought into contact with a cylindrical connection element (27) of the shaft (2) at three locations (51, 52; 53) of the inner cylinder periphery.
7. A machine reaming tool according to claim 6, wherein the cutout (50) formed as a connection element, in the end-face (15) of the interchangeable head (1) is essentially circularly cylindrical, and in each case comprises a contact segment (51, 52) or a contact point, at three locations of the inner cylinder periphery, at which the cutout (50) is formed somewhat more narrowly, and that a part of the shaft (2) which is designed as a connection element (27) is designed essentially circularly cylindrical.

8. A machine reaming tool according to claim 1, wherein an extension of one of the contact segments (51) in the peripheral direction is comparatively larger than the extension of the two other contact segments (52), in particular is one and a half to two times larger, and that corresponding to this, the shaft (1) comprises a plane surface (28) on a part sector of the periphery.
9. A machine reaming tool according to one of the preceding claims, wherein the interchangeable head (1) comprises a first side and an oppositely lying side, and may be assembled selectively with the first or the second side against the shaft (2) and may be used for reaming in both cases.
10. A machine reaming tool according to one of the claims 1 to 8, comprising a further machining tool (200) which is fastened coaxially to the interchangeable head (1) on the shaft (2).
11. A machine reaming tool according to claim 10, wherein the further machining tool (200) is designed with a smaller machining diameter than the interchangeable head (1).
12. A machine reaming tool according to one of the claims 10 or 11, wherein the further machining tool (200) with fastening means which are central with respect to the axis of the shaft (2), and the interchangeable head (1) with several fastening means arranged next to the axis of the shaft (2), may be assembled on the shaft (2).
13. A machine reaming tool according to one of the claims 1 to 9, wherein the interchangeable head (1) comprises several cutters (16), and each of the cutters (16) is formed on the first side of the interchangeable head (1) as well as on a second side of the interchangeable head (1), for cutting, and for this comprises a leading cut portion with a back-off clearance.
14. A machine reaming tool according to claim 13, wherein the cutter (16) on the first side of the interchangeable head (1) comprises a first leading cut portion (171) with a back-off clearance of firstly 3° to 10° and then, after 0.05 to 1 mm in the peripheral direction, of 10° to 20° , and on the second side of the interchangeable head (1) comprises a second leading cut portion (172) with a back-off clearance of 10° to 20° .
15. An interchangeable head for a machine reaming tool, said interchangeable head being formed as one piece, characterised in that the interchangeable head (1) in the axial direction and at each location, thus including the means for exchange adaptation, is thinner than a maximal thickness h_{\max} , wherein this maximal thickness h_{\max} in millimetres is computed from a diameter D1 of the interchangeable head in millimetres as $h_{\max} = 6\text{mm} + (1/10) \cdot (D1 - 12\text{mm})$.

16. An interchangeable head (1) according to claim 15, wherein the interchangeable head (1) in the axial direction has a thickness of maximally 6 mm, preferably maximally 5 mm or less.
17. An interchangeable head (1) according to claim 15 or 16, wherein the interchangeable head (1) comprises a cutout (50) designed as a connection element, for the centring fastening of the exchange head (1) on a shaft (2).
18. An interchangeable head according to one of the claims 15 to 17, wherein the cutout (50) designed as a connection element forms an axially central conical socket (11).
19. An interchangeable head (1) according to one of the claims 15 to 18, wherein the interchangeable head (1) is manufactured of a material manufactured by sintering, such as hard metal, cermet, ceramic or CBN (cubic boron nitride).
20. An interchangeable head (1) according to one of the claims 15 to 19, wherein the interchangeable head (1) comprises several continuous bores in the axial direction, each with a recess (14) for accommodating a screw head.
21. An interchangeable head (1) according to one of the claims 15 to 20, wherein the interchangeable head (1) has a first side and an oppositely lying second side, and may be selectively assembled with the first or the second side against the shaft (2), and in both cases may be used for reaming.
22. An interchangeable head (1) according to claim 21, wherein the interchangeable head (1) comprises continuous bores as connection means (197, 198) for assembly, selectively with the first or the second side against the shaft (2).
23. An interchangeable head (1) according to one of the claims 21 or 22, comprising two coaxial conical sockets (195, 196) for centring the interchangeable head (1), wherein each of the two conical sockets (195, 196) leads to the inside in each case from one of the sides of the interchangeable head (1).
24. An interchangeable head according to one of the claims 21 to 23, comprising several cutters (16), wherein the cutters (16), proceeding from a first side (193) of the interchangeable head (1) comprises a first leading cut portion (171), then a first reaming corner (191) and then a first section (181) of the guide portion (18) which tapers towards the middle of the cutter (16), as well as proceeding from a second side (194) of the interchangeable head (1), a second leading cut portion (172), then a second reaming corner (192) and then a second section (182) of the guide portion (18) which tapers towards the middle of the cutter (16).

25. An interchangeable head 24, wherein the cutters (16) in their middle comprise a groove running transversely to the guide portion (18).

26. An interchangeable head (1) according to one of the claims 15 to 25, wherein the interchangeable head (1) comprises several cutters (16), and each of the cutters (16) is formed on a first side of the interchangeable head (1) as well as on a second side of the interchangeable head (1), for cutting, and for this comprises a leading cut portion with a back-off clearance.

27. An interchangeable head (1) according to claim 26, wherein the cutter (16) on the first side of the interchangeable head (1) comprises a first leading cut portion (171) with a back-off clearance firstly of 3° to 10° and then, after 0.05 to 1 mm in the peripheral direction, of 10° to 20°, and on the second side of the interchangeable head (1) comprises a second leading cut portion (172) with a back-off clearance of 10° to 20°.

28. A shaft (2) for machine reaming tool, comprising an essentially rotationally symmetrical shaft with an end-face plane surface (25), characterised in that the shaft (2) comprises a connection lug (21) projecting out of this plane surface (25), for assembly of an attachable interchangeable head (1).

29. A shaft (2) according to claim 28, wherein the connection lug is a conical projection (21).

30. A shaft (2) according to one of the claims 28 to 29, comprising means for fastening an exchangeable cutting tip (1) and means for fastening a further machining tool (200).

31. A shaft (2) according to claim 30, wherein the means for fastening the further machining tool (200) is a first bore for receiving a screw or a tie rod, and is arranged axially centrally in the shaft (2), and the means for fastening the exchangeable cutting tip comprises a plurality of threaded holes which are arranged around the first bore.

32. A method for manufacturing an interchangeable head (1) according to one of the claims 13 to 14, comprising the following steps:

- reaming the bore to the nominal dimension by way of the first leading cut portion (171) and above all by way of a reaming corner (181) on the front side of the cutters (16);
- milling a chamfer at the exit of the bore by way of a second leading cut portion (172) on a rear side of the cutters (16).

33. A method according to claim 33, comprising the preceding step:

- milling a chamfer at the entry of a bore by way of a first leading cut portion (171) on the front side of the cutters (16).